Partially acidulated phosphate rocks as fertilisers for pastures

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Partially acidulated phosphate rocks (PAPR) are cheaper on per unit P basis than fully acidulated fertilisers such as single or triple superphosphate (TSP). This paper summarises the results from 7 field trials conducted throughout New Zealand on the agronomic effectiveness of PAPRs compared with TSP.

Methods

All the trials were small plot ones (mostly 4 x 1.5 m) on well established grass/clover pastures. The soil pH values ranged from 5.6-6.1. TSP was used as the standard fertiliser. The PAPRs were prepared from finely ground or unground North Carolina phosphate rock (NCPR) and granulated to commercial grade. The degree of acidulation was 30%, meaning that the amount of phosphoric acid used was about one third of that needed to make TSP. TSP was applied at four rates whereas PAPR at three rates in site 1, two rates in site 2 and at one rate (0.75 of maintenance) in other sites. A randomised block design with three replications was employed.

Results and discussion

Herbage data (Table 1) show a yield response of 17% (average of sites) at the 0.75 maintenance rate which may be considered low but is similar to what farmers get under maintenance situation. The results indicate that the PAPR is in the least as effective as TSP.

Table 1. Herbage yields (t ha⁻¹ yr⁻¹) from control and 0.75 maintenance rate. Yields at two maintenance rate of TSP (2M) are also given for comparison.

Site no.	Clay mineral	Control (no P)	TSP	PAPR 30%	LSD 5%	Yield at 2M
1	Allophane (1)+	9.3	10.2	10.3	0.60	11.1
2	Allophane	8 7	10 4	9.9	0.58	10.5
3	Hallovsite	10.4	12.2	12.5	1.16	12.6
4	Allophane	9.6	11.8	12.3	1.05	12.7
5	(Illite,					1000
	(Hydrous mica	10.2	11.8	11.9	1.09	13.3
6	(Illite, (1)+	6.2	7.2	7.1	0.57	7.7
	(Hydrous mica(2)	4.9	5.8	5.7	0.69	6.4
7	Allophane	4.7	5.4	5.7	0.53	5.8
Mean	TRACTOR STRUCTURES	8.0	9.4	9.5		10.1

There was a positive interaction between the soluble P and the rock phosphate in PAPRs in terms of their availability to plants.